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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/686,766

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EXAMINER
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ESHETE, ZELALEM

ART UNIT	PAPER NUMBER
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3748

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05/20/2008

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/686,766	<b>Applicant(s)</b> SUZUKI ET AL.	
	<b>Examiner</b> Zelalem Eshete	<b>Art Unit</b> 3748	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 07 April 2008.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1,3 and 5-30 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,3 and 5-30 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                       | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>4/7/08</u> .  | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

This Office action is in response to the RCE filed on 4/7/2008.

### ***Priority***

For the applicant to rely upon the foreign priority papers to overcome this rejection, a translation of said papers has to be made of record.

### ***Claim Rejections - 35 USC § 103***

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1,3,7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Oki (CN1421541) in view of Takemura (6,342,109).

Regarding claims 1,7: Oki discloses a full type rolling bearing formed of an outer ring, an inner ring and rollers that are made of steel (figure 1); wherein at least one of said outer ring, inner ring and rollers contains a hydrogen content of at most 0.5 ppm,

carbon in an amount of 0.95% to 1.10%, silicon in an amount of 0.15% to 0.35%, manganese in an amount of at most 0.5%, chromium in an amount of 1.30% to 1.60% with the remainder formed of FE and unavoidable impurities (abstract); has a carbonitrided layer in its surface layer and the austenite crystal grain size number of the surface layer is greater than 10 (abstract).

Oki fails to disclose a non diffusible hydrogen concentration of at most 0.5 ppm; phosphorous in an amount of at most 0.025, sulfur in an amount of at most 0.025%; and molybdenum in an amount of less than 0.08%.

Takemura shows total (nondiffusible) hydrogen content in carbonitrided material can be not more than 0.1 ppm in order to enhance the brittleness (see column 10, lines 15 to 25).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Oki by providing non-diffusible hydrogen content as taught by Takemura in order to modify the engineering property of the device. It also would have been obvious to maintain the little proportions of phosphorous, sulfur, and molybdenum consistent to commercially available steel such as JIS-SUJ2 in order to achieve cost reduction.

As to the method of manufacturing processes, a product by process claim is rejected over a prior art product that appears to be identical, although produced by a different process, the burden is upon the applicants to come forward with evidence establishing an unobvious difference between the two. See *In re Marosi*, 218 USPQ 289 (Fed. Cir. 1983).

Additionally, Oki teaches the claimed manufacturing processes (abstract).

Regarding claim 3: Oki discloses carbide and/or nitride and an austenite phase coexist in the carbonitrided surface layer of the steel (see abstract).

As to the method of manufacturing processes, a product by process claim is rejected over a prior art product that appears to be identical, although produced by a different process, the burden is upon the applicants to come forward with evidence establishing an unobvious difference between the two. See *In re Marosi*, 218 USPQ 289 (Fed. Cir. 1983).

3. Claim 5 rejected under 35 U.S.C. 103(a) as being unpatentable over Oki (CN1421541) in view of Takemura (6,342,109) and further in view of Takamura (6,224,688).

Oki disclose the claimed invention as recited above; however, fails to disclose cold working before being carbonitrided.

Takemura teaches cold working before being carbonitrided (see column 8, lines 29 to 45). Takemura further teaches that such arrangement provides long life and high reliability (abstract).

It would have been obvious to one having an ordinary skill in the art at the time the invention was made to modify the system of Oki as modified above by providing the

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arrangement as taught by Takemura in order to enhance the physical properties of the device as taught by Takemura.

Additionally, as to the method of manufacturing processes, a product by process claim is rejected over a prior art product that appears to be identical, although produced by a different process, the burden is upon the applicants to come forward with evidence establishing an unobvious difference between the two. See *In re Marosi*, 218 USPQ 289 (Fed. Cir. 1983).

4. Claims 1,7,10,16,19,25,28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Oki (CN1421541) in view of Takemura (6,342,109) and further in view of Brothers (6,328,009)

Regarding claims 1,7: Oki as modified above discloses the claimed invention except the roller's application in a valve actuation system.

Brothers teaches the roller's application in a valve actuation system (figure 1-9).

It would have been obvious to one having an ordinary skill in the art at the time the invention was made to modify the system of Oki by implementing it in a valve actuation system in order to reduce friction.

Regarding claim 10: Brothers discloses said cam follower body is mounted on one end of a rocker arm, said rocker arm is pivotably attached to a rotational shaft

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located between said one end and the other end, one end of an open/close valve of said engine abuts on said other end (see figures 1,2), said cam follower body on said one end has a bifurcated roller supporting portion, and said roller shaft is fixed to said bifurcated roller supporting portion (see figure 9).

Regarding claim 16: Brothers discloses a rocker arm is pivotably attached to a rotational shaft located between one end and the other end of said rocker arm (see figures 1-9), an end of an open/close valve of said engine abuts on said one end (see numeral 20), said other end abuts on one end of an interlocking rod transmitting a stress from said cam (see numeral 16), said cam follower body is mounted on the other end of said interlocking rod (see numeral 14), said one end and said other end of said interlocking rod being located respectively on said rocker arm and said cam, and said roller shaft is attached to said cam follower body and abuts on said cam (see figures 1,2,9).

Regarding claim 19: Brothers discloses said bearing elements are full type needle bearings (see figures 1-9; column 2, lines 27 to 45).

Regarding claims 25,28: Brothers discloses the claimed invention as recited above except for caulked end and entirely press-formed. As to the method of caulking/press fitting, a product by process claim is rejected over a prior art product that appears to be identical, although produced by a different process, the burden is upon

the applicants to come forward with evidence establishing an unobvious difference between the two. See *In re Marosi*, 218 USPQ 289 (Fed. Cir. 1983)

5. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Oki in view of Takemura as applied to claim 1 above; and further in view of Yoshida et al. (5,803,993).

Oki as modified above discloses the claimed invention as recited above; however, fails to disclose a compression residual stress of at least 500 Mpa.

However, Yoshida teaches compression residual stress are controlled to 850 Mpa or higher, and this can raise fatigue strength (see column 2, lines 20 to 27).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to further modify the system of Oki as modified above by providing a residual stress of at least 850 Mpa as taught by Yoshida in order to raise the fatigue strength of the device as taught by Yoshida.

6. Claims 1,7,13,25,28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Oki as modified above and further in view of Faville.

Regarding claims 1,7: Oki as modified above discloses the claimed invention except the roller's application in a valve actuation system.



Faville teaches the roller's application in a valve actuation system (figures 1-3).

It would have been obvious to one having an ordinary skill in the art at the time the invention was made to modify the system of Oki by implementing it in a valve actuation system in order to reduce friction.

Regarding claim 13: Faville discloses said cam follower body is mounted between one end and the other end of a rocker arm (see figure 1), said roller shaft is fixed in a roller hole extending between two sidewalls of the rocker arm (see figure 3), an end of an open/close valve of said engine abuts on said one end of said rocker arm, and a pivot abuts on said other end (see figure 1).

Regarding claims 25,28: Faville discloses the claimed invention as recited above except for caulked end and entirely press-formed. As to the method of caulking/press fitting, a product by process claim is rejected over a prior art product that appears to be identical, although produced by a different process, the burden is upon the applicants to come forward with evidence establishing an unobvious difference between the two. See *In re Marosi*, 218 USPQ 289 (Fed. Cir. 1983)

7. Claims 1,7,10,22,25,28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Oki as modified above and further in view of Bando (JP63-185917).

Regarding claims 1,7: Oki as modified above discloses the claimed invention except the roller's application in a valve actuation system.

Bando teaches the roller's application in a valve actuation system (figures 1-3).

It would have been obvious to one having an ordinary skill in the art at the time the invention was made to modify the system of Oki by implementing it in a valve actuation system in order to reduce friction.

Regarding claim 10: Bando discloses said cam follower body is mounted on one end of a rocker arm, said rocker arm is pivotably attached to a rotational shaft located between said one end and the other end, one end of an open/close valve of said engine abuts on said other end (see figure 4), said cam follower body on said one end has a bifurcated roller supporting portion, and said roller shaft is fixed to said bifurcated roller supporting portion (see figure 6).

Regarding claim 22: Bando discloses said roller shaft has its end with a hardness lower than that of its central portion (see abstract).

Regarding claims 25,28: Bando discloses the claimed invention as recited above except for caulked end and entirely press-formed. As to the method of caulking/press fitting, a product by process claim is rejected over a prior art product that appears to be identical, although produced by a different process, the burden is upon the applicants to

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come forward with evidence establishing an unobvious difference between the two. See *In re Marosi*, 218 USPQ 289 (Fed. Cir. 1983)

8. Claims 8,11,17,20,26,29, 9,12,18,21,27,30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Oki in view of Takemura and further in view of Brothers; and further in view of Kim et al. (Journal of Heat Treat.).

Regarding claim 8: Oki as modified above discloses the claimed invention and Brothers further discloses a roller cam follower of an engine (see figures 1-9), comprising: an outer ring being in rolling contact with a camshaft of the engine (see numeral 30), a roller shaft located inside said outer ring and fixed to a cam follower body (see numeral 36); and bearing elements placed between said outer ring and said roller shaft (see numerals 32,35).

Oki as modified above fails to disclose a fracture stress of at least 2650 Mpa.

Kim shows the fracture strength (stress) of carbonitrided steels can be 3220 Mpa (see abstract).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system of Oki as modified above by providing the arrangement as taught by Kim to use the greater fracture stress in order to increase the longevity of the device.

As to the method of manufacturing processes, a product by process claim is rejected over a prior art product that appears to be identical, although produced by a different process, the burden is upon the applicants to come forward with evidence establishing an unobvious difference between the two. See *In re Marosi*, 218 USPQ 289 (Fed. Cir. 1983).

Regarding claim 11: Brothers discloses said cam follower body is mounted on one end of a rocker arm, said rocker arm is pivotably attached to a rotational shaft located between said one end and the other end, one end of an open/close valve of said engine abuts on said other end (see figures 1,2), said cam follower body on said one end has a bifurcated roller supporting portion, and said roller shaft is fixed to said bifurcated roller supporting portion (see figure 9).

Regarding claim 17: Brothers discloses a rocker arm is pivotably attached to a rotational shaft located between one end and the other end of said rocker arm (see figures 1-9), an end of an open/close valve of said engine abuts on said one end (see numeral 20), said other end abuts on one end of an interlocking rod transmitting a stress from said cam (see numeral 16), said cam follower body is mounted on the other end of said interlocking rod (see numeral 14), said one end and said other end of said interlocking rod being located respectively on said rocker arm and said cam, and said roller shaft is attached to said cam follower body and abuts on said cam (see figures 1,2,9).

Regarding claim 20: Brothers discloses said bearing elements are full type needle bearings (see figures 1-9; column 2, lines 27 to 45).

Regarding claims 26,29: Brothers discloses the claimed invention as recited above except for caulked end and entirely press-formed. As to the method of caulking/press fitting, a product by process claim is rejected over a prior art product that appears to be identical, although produced by a different process, the burden is upon the applicants to come forward with evidence establishing an unobvious difference between the two. See *In re Marosi*, 218 USPQ 289 (Fed. Cir. 1983)

Regarding claim 9: Oki discloses the claimed invention as recited above and Brothers further discloses a roller cam follower of an engine (see figures 1-9), comprising: an outer ring being in rolling contact with a camshaft of the engine (see numeral 30), a roller shaft located inside said outer ring and fixed to a cam follower body (see numeral 36); and bearing elements placed between said outer ring and said roller shaft (see numerals 32,35).

Regarding claim 12: Brothers discloses said cam follower body is mounted on one end of a rocker arm, said rocker arm is pivotably attached to a rotational shaft located between said one end and the other end, one end of an open/close valve of said engine abuts on said other end (see figures 1,2), said cam follower body on said

one end has a bifurcated roller supporting portion, and said roller shaft is fixed to said bifurcated roller supporting portion (see figure 9).

Regarding claim 18: Brothers discloses a rocker arm is pivotably attached to a rotational shaft located between one end and the other end of said rocker arm (see figures 1-9), an end of an open/close valve of said engine abuts on said one end (see numeral 20), said other end abuts on one end of an interlocking rod transmitting a stress from said cam (see numeral 16), said cam follower body is mounted on the other end of said interlocking rod (see numeral 14), said one end and said other end of said interlocking rod being located respectively on said rocker arm and said cam, and said roller shaft is attached to said cam follower body and abuts on said cam (see figures 1,2,9).

Regarding claim 21: Brothers discloses said bearing elements are full type needle bearings (see figures 1-9; column 2, lines 27 to 45).

Regarding claims 27,30: Brothers discloses the claimed invention as recited above except for caulked end and entirely press-formed. As to the method of caulking/press fitting, a product by process claim is rejected over a prior art product that appears to be identical, although produced by a different process, the burden is upon the applicants to come forward with evidence establishing an unobvious difference between the two. See *In re Marosi*, 218 USPQ 289 (Fed. Cir. 1983)

9. Claims 8,14,26,29, 9,15,27,30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Oki in view of Takamura and further in view of Faville and further in view of Kim.

Regarding claim 8: Oki as modified above discloses the claimed invention as recited above; and Faville further discloses a roller cam follower of an engine (see figures 1-3), comprising: an outer ring being in rolling contact with a camshaft of the engine (see numeral 42), a roller shaft located inside said outer ring and fixed to a cam follower body (see numeral 58); and bearing elements placed between said outer ring and said roller shaft (see numeral 60).

Oki as modified above fails to disclose a fracture stress of at least 2650 Mpa.

Kim shows the fracture strength (stress) of carbonitrided steels can be 3220 Mpa (see abstract).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system of Oki as modified above by providing the arrangement as taught by Kim to use the greater fracture stress in order to increase the longevity of the device.

As to the method of manufacturing processes, a product by process claim is rejected over a prior art product that appears to be identical, although produced by a different process, the burden is upon the applicants to come forward with evidence

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establishing an unobvious difference between the two. See *In re Marosi*, 218 USPQ 289 (Fed. Cir. 1983).

Regarding claim 14: Faville discloses said cam follower body is mounted between one end and the other end of a rocker arm (see figure 1), said roller shaft is fixed in a roller hole extending between two sidewalls of the rocker arm (see figure 3), an end of an open/close valve of said engine abuts on said one end of said rocker arm, and a pivot abuts on said other end (see figure 1).

Regarding claim 26,29: Faville discloses the claimed invention as recited above except for caulked end and entirely press-formed. As to the method of caulking/press fitting, a product by process claim is rejected over a prior art product that appears to be identical, although produced by a different process, the burden is upon the applicants to come forward with evidence establishing an unobvious difference between the two. See *In re Marosi*, 218 USPQ 289 (Fed. Cir. 1983)

Regarding claim 9: Oki as modified above discloses the claimed invention as modified above and Faville further discloses a roller cam follower of an engine (see figures 1-3), comprising: an outer ring being in rolling contact with a camshaft of the engine (see numeral 42), a roller shaft located inside said outer ring and fixed to a cam follower body (see numeral 58); and bearing elements placed between said outer ring and said roller shaft (see numeral 60).



Regarding claim 15: Faville discloses said cam follower body is mounted between one end and the other end of a rocker arm (see figure 1), said roller shaft is fixed in a roller hole extending between two sidewalls of the rocker arm (see figure 3), an end of an open/close valve of said engine abuts on said one end of said rocker arm, and a pivot abuts on said other end (see figure 1).

Regarding claim 27,30: Faville discloses the claimed invention as recited above except for caulked end and entirely press-formed. As to the method of caulking/press fitting, a product by process claim is rejected over a prior art product that appears to be identical, although produced by a different process, the burden is upon the applicants to come forward with evidence establishing an unobvious difference between the two. See *In re Marosi*, 218 USPQ 289 (Fed. Cir. 1983)

10. Claims 8,11,23,26,29, 9,12,24,27,30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Oki in view of Takemura and further in view of Bando; and further in view of Kim et al. (Journal of Heat Treat.).

Regarding claim 8: Oki as modified above discloses the claimed invention as recited above and Bando further discloses a roller cam follower of an engine (see figure 4), comprising: an outer ring being in rolling contact with a camshaft of the engine, a

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roller shaft located inside said outer ring and fixed to a cam follower body; and bearing elements placed between said outer ring and said roller shaft (see figure 6).

Oki as modified above fails to disclose a fracture stress of at least 2650 Mpa.

Kim shows the fracture strength (stress) of carbonitrided steels can be 3220 Mpa (see abstract).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system of Oki as modified above by providing the arrangement as taught by Kim to use the greater fracture stress in order to increase the longevity of the device.

As to the method of manufacturing processes, a product by process claim is rejected over a prior art product that appears to be identical, although produced by a different process, the burden is upon the applicants to come forward with evidence establishing an unobvious difference between the two. See *In re Marosi*, 218 USPQ 289 (Fed. Cir. 1983).

Regarding claim 11: Bando discloses said cam follower body is mounted on one end of a rocker arm, said rocker arm is pivotably attached to a rotational shaft located between said one end and the other end, one end of an open/close valve of said engine abuts on said other end (see figure 4), said cam follower body on said one end has a bifurcated roller supporting portion, and said roller shaft is fixed to said bifurcated roller supporting portion (see figure 6).

Regarding claim 23: Bando discloses said roller shaft has its end with a hardness lower than that of its central portion (see abstract).

Regarding claims 26,29: Bando discloses the claimed invention as recited above except for caulked end and entirely press-formed. As to the method of caulking/press fitting, a product by process claim is rejected over a prior art product that appears to be identical, although produced by a different process, the burden is upon the applicants to come forward with evidence establishing an unobvious difference between the two. See *In re Marosi*, 218 USPQ 289 (Fed. Cir. 1983)

Regarding claim 9: Oki as modified above discloses the claimed invention as recited above; and Bando further discloses a roller cam follower of an engine (see figure 4), comprising: an outer ring being in rolling contact with a camshaft of the engine, a roller shaft located inside said outer ring and fixed to a cam follower body; and bearing elements placed between said outer ring and said roller shaft (see figure 6).

Regarding claim 12: Bando discloses said cam follower body is mounted on one end of a rocker arm, said rocker arm is pivotably attached to a rotational shaft located between said one end and the other end, one end of an open/close valve of said engine abuts on said other end (see figure 4), said cam follower body on said one end has a bifurcated roller supporting portion, and said roller shaft is fixed to said bifurcated roller supporting portion (see figure 6).

Regarding claim 24: Bando discloses said roller shaft has its end with a hardness lower than that of its central portion (see abstract).

Regarding claims 27,30: Bando discloses the claimed invention as recited above except for caulked end and entirely press-formed. As to the method of caulking/press fitting, a product by process claim is rejected over a prior art product that appears to be identical, although produced by a different process, the burden is upon the applicants to come forward with evidence establishing an unobvious difference between the two. See *In re Marosi*, 218 USPQ 289 (Fed. Cir. 1983)

11. Claims 1,3-5,7,10,16,19,25,28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Brothers (6,328,009) in view of Mitamura (5,085,733); and further in view of Takemura et al. (6,224,688), further in view of Takemura (6,342,109); and further in view of Ueda (JP10-204612).

Regarding claims 1,7: Brothers discloses a full type rolling bearing formed of an outer ring, an inner ring and rollers (see figures 1-9).

Brothers fails to disclose compositions of JIS-SUJ2 steel, at least one of said outer ring, inner ring and rollers are made of steel and has a carbonitrided layer in its

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surface layer, and the austenite crystal grain size number of the surface layer is greater than 10; and has a non-diffusible hydrogen concentration of at most 0.5 ppm.

Mitamura teaches using JIS-SUJ2 steel in order to secure a long rolling fatigue life (see column 1, lines 15 to 25).

Takemura (6,224,688) teaches at least one of said outer ring, inner ring and rollers are made of steel and has a carbonitrided layer in its surface layer, and the austenite crystal grain size number of the surface layer is greater than 10 (see abstract, column 5, lines 55 to 60). Takemura (6,224,688) further teaches such arrangement achieves long life and high reliability (see abstract).

In addition, Takemura (6,342,109) shows total (nondiffusible) hydrogen content in carbonitrided material can be not more than 0.1 ppm in order to enhance the brittleness (see column 10, lines 15 to 25).

Furthermore, Ueda shows the total hydrogen content can be less than 0.5 ppm in order to prevent soot (see abstract; figure 1).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Brothers by providing JIS-SUJ2 steel as taught by Mitamura in order to secure a long rolling fatigue life as taught by Mitamura. It also would have been obvious to further modify by providing carbonitrided layer as taught by Takemura (6,224,688) in order to prolong life and improve reliability as taught by Takemura (6,224,688). It also would have been obvious to one having ordinary skill in the art at the time the invention was made to further modify Brothers' device by providing

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hydrogen content as taught by Takemura (6,342,109)/Ueda in order to enhance the brittleness and prevent soot as taught by Takemura (6,342,109)/Ueda.

As to the method of manufacturing processes, a product by process claim is rejected over a prior art product that appears to be identical, although produced by a different process, the burden is upon the applicants to come forward with evidence establishing an unobvious difference between the two. See *In re Marosi*, 218 USPQ 289 (Fed. Cir. 1983).

Additionally, Takemura et al. (6,440,232) shows the inherent manufacturing steps of the manufacturing process for carbonitriding (see figure 3A).

There is no reason to believe the known manufacturing process wouldn't use the claimed numerical characteristic values or modify the quenching temperature for a desired size of the structure.

Exhibit: Maeda et al (6,158,263) shows a quenching temperature reduced to 800-840 degrees to adjust the size of the structure (column 3:1-14).

Regarding claim 3: Takemura discloses carbide and/or nitride and an austenite phase coexist in the carbonitrided surface layer of the steel (see column 5, lines 62 to 67).

As to the method of manufacturing processes, a product by process claim is rejected over a prior art product that appears to be identical, although produced by a different process, the burden is upon the applicants to come forward with evidence

establishing an unobvious difference between the two. See *In re Marosi*, 218 USPQ 289 (Fed. Cir. 1983).

Regarding claim 5: Takemura discloses cold working before being carbonitrided (see column 8, lines 29 to 45).

Additionally, as to the method of manufacturing processes, a product by process claim is rejected over a prior art product that appears to be identical, although produced by a different process, the burden is upon the applicants to come forward with evidence establishing an unobvious difference between the two. See *In re Marosi*, 218 USPQ 289 (Fed. Cir. 1983).

Regarding claim 10: Brothers discloses said cam follower body is mounted on one end of a rocker arm, said rocker arm is pivotably attached to a rotational shaft located between said one end and the other end, one end of an open/close valve of said engine abuts on said other end (see figures 1,2), said cam follower body on said one end has a bifurcated roller supporting portion, and said roller shaft is fixed to said bifurcated roller supporting portion (see figure 9).

Regarding claim 16: Brothers discloses a rocker arm is pivotably attached to a rotational shaft located between one end and the other end of said rocker arm (see figures 1-9), an end of an open/close valve of said engine abuts on said one end (see numeral 20), said other end abuts on one end of an interlocking rod transmitting a

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stress from said cam (see numeral 16), said cam follower body is mounted on the other end of said interlocking rod (see numeral 14), said one end and said other end of said interlocking rod being located respectively on said rocker arm and said cam, and said roller shaft is attached to said cam follower body and abuts on said cam (see figures 1,2,9).

Regarding claim 19: Brothers discloses said bearing elements are full type needle bearings (see figures 1-9; column 2, lines 27 to 45).

Regarding claims 25,28: Brothers discloses the claimed invention as recited above except for caulked end and entirely press-formed. As to the method of caulking/press fitting, a product by process claim is rejected over a prior art product that appears to be identical, although produced by a different process, the burden is upon the applicants to come forward with evidence establishing an unobvious difference between the two. See *In re Marosi*, 218 USPQ 289 (Fed. Cir. 1983)

12. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Brothers (6,328,009) in view of Takemura et al. (6,224,688) as applied to claim 1 above; and further in view of Yoshida et al. (5,803,993).



Brothers as modified above discloses the claimed invention as recited above; however, fails to disclose a compression residual stress of at least 500 Mpa.

However, Yoshida teaches compression residual stress are controlled to 850 Mpa or higher, and this can raise fatigue strength (see column 2, lines 20 to 27).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to further modify the system of Brothers by providing a residual stress of at least 850 Mpa as taught by Yoshida in order to raise the fatigue strength of the device as taught by Yoshida.

13. Claims 1,3,5,7,13,25,28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Faville et al. (5,979,383) in view of Mitamura, and further in view of Takemura et al. (6,224,688); and further in view of Takemura (6,342,109), and further in view of Ueda.

Regarding claims 1,7: Faville discloses a full type rolling bearing formed of an outer ring, an inner ring and rollers (see figures 1-3).

Brothers fails to disclose compositions of JIS-SUJ2 steel, at least one of said outer ring, inner ring and rollers are made of steel and has a carbonitrided layer in its surface layer, and the austenite crystal grain size number of the surface layer is greater than 10; and has a hydrogen content of at most 0.5 ppm.

Mitamura teaches using JIS-SUJ2 steel in order to secure a long rolling fatigue life (see column 1, lines 15 to 25).

Takemura teaches at least one of said outer ring, inner ring and rollers are made of steel and has a carbonitrided layer in its surface layer, and the austenite crystal grain size number of the surface layer is greater than 11 (see abstract, column 5, lines 55 to 60). Takemura further teaches such arrangement achieves long life and high reliability (see abstract).

In addition, Takemura (6,342,109) shows the diffusible hydrogen content in carbonitrided material can be not more than 0.1 ppm in order to enhance the brittleness (see column 10, lines 15 to 25).

Furthermore, Ueda shows the total hydrogen content can be less than 0.5 ppm in order to prevent soot (see abstract; figure 1).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Faville by providing JIS-SUJ2 steel as taught by Mitamura in order to secure a long rolling fatigue life as taught by Mitamura. It also would have been obvious to further modify by providing carbonitrided layer as taught by Takemura (6,224,688) in order to prolong life and improve reliability as taught by Takemura (6,224,688). It also would have been obvious to one having ordinary skill in the art at the time the invention was made to further modify Faville's device by providing hydrogen content as taught by Takemura (6,342,109)/Ueda in order to enhance the brittleness and prevent soot as taught by Takemura (6,342,109)/Ueda.

As to the method of manufacturing processes, a product by process claim is rejected over a prior art product that appears to be identical, although produced by a different process, the burden is upon the applicants to come forward with evidence

establishing an unobvious difference between the two. See *In re Marosi*, 218 USPQ 289 (Fed. Cir. 1983).

Additionally, Takemura et al. (6,440,232) shows the inherent manufacturing steps of the manufacturing process for carbonitriding (see figure 3A).

There is no reason to believe the known manufacturing process wouldn't use the claimed numerical characteristic values or modify the quenching temperature for a desired size of the structure.

Exhibit: Maeda et al (6,158,263) shows a quenching temperature reduced to 800-840 degrees to adjust the size of the structure (column 3:1-14).

Regarding claim 3: Takemura discloses carbide and/or nitride and an austenite phase coexist in the carbonitrided surface layer of the steel (see column 5, lines 62 to 67).

As to the method of manufacturing processes, a product by process claim is rejected over a prior art product that appears to be identical, although produced by a different process, the burden is upon the applicants to come forward with evidence establishing an unobvious difference between the two. See *In re Marosi*, 218 USPQ 289 (Fed. Cir. 1983).

Regarding claim 5: Takemura discloses cold working before being carbonitrided (see column 8, lines 29 to 45).

Additionally, as to the method of manufacturing processes, a product by process claim is rejected over a prior art product that appears to be identical, although produced by a different process, the burden is upon the applicants to come forward with evidence establishing an unobvious difference between the two. See *In re Marosi*, 218 USPQ 289 (Fed. Cir. 1983).

Regarding claim 13: Faville discloses said cam follower body is mounted between one end and the other end of a rocker arm (see figure 1), said roller shaft is fixed in a roller hole extending between two sidewalls of the rocker arm (see figure 3), an end of an open/close valve of said engine abuts on said one end of said rocker arm, and a pivot abuts on said other end (see figure 1).

Regarding claims 25,28: Faville discloses the claimed invention as recited above except for caulked end and entirely press-formed. As to the method of caulking/press fitting, a product by process claim is rejected over a prior art product that appears to be identical, although produced by a different process, the burden is upon the applicants to come forward with evidence establishing an unobvious difference between the two. See *In re Marosi*, 218 USPQ 289 (Fed. Cir. 1983)

14. Claims 1,3,5,7,10,22,25,28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bando (JP63-185917) in view of Mitamura; and further in view of

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Takemura et al. (6,224,688); and further in view of Takemura (6,342,109), and further in view of Ueda.

Regarding claims 1,7: Bando discloses a full type rolling bearing formed of an outer ring, an inner ring and rollers (see figures 1-3).

Brothers fails to disclose composition of JIS-SUJ2 steel, at least one of said outer ring, inner ring and rollers are made of steel and has a carbonitrided layer in its surface layer, and the austenite crystal grain size number of the surface layer is greater than 10.

Mitamura teaches using JIS-SUJ2 steel in order to secure a long rolling fatigue life (see column 1, lines 15 to 25).

Takemura teaches at least one of said outer ring, inner ring and rollers are made of steel and has a carbonitrided layer in its surface layer, and the austenite crystal grain size number of the surface layer is greater than 11 (see abstract, column 5, lines 55 to 60). Takemura further teaches such arrangement achieves long life and high reliability (see abstract).

In addition, Takemura (6,342,109) shows the diffusible hydrogen content in carbonitrided material can be not more than 0.1 ppm in order to enhance the brittleness (see column 10, lines 15 to 25).

Furthermore, Ueda shows the total hydrogen content can be less than 0.5 ppm in order to prevent soot (see abstract; figure 1).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Bando by providing JIS-SUJ2 steel as taught by Mitamura in order to secure a long rolling life as taught by Mitamura. It also would have been obvious to further modify by providing carbonitrided layer as taught by Takemura (6,224,688) in order to prolong life and improve reliability as taught by Takemura (6,224,688). It also would have been obvious to one having ordinary skill in the art at the time the invention was made to further modify Bando's device by providing hydrogen content as taught by Takemura (6,342,109)/Ueda in order to enhance the brittleness and prevent soot as taught by Takemura (6,342,109)/Ueda.

As to the method of manufacturing processes, a product by process claim is rejected over a prior art product that appears to be identical, although produced by a different process, the burden is upon the applicants to come forward with evidence establishing an unobvious difference between the two. See *In re Marosi*, 218 USPQ 289 (Fed. Cir. 1983).

Additionally, Takemura et al. (6,440,232) shows the inherent manufacturing steps of the manufacturing process for carbonitriding (see figure 3A).

There is no reason to believe the known manufacturing process wouldn't use the claimed numerical characteristic values or modify the quenching temperature for a desired size of the structure.

Exhibit: Maeda et al (6,158,263) shows a quenching temperature reduced to 800-840 degrees to adjust the size of the structure (column 3:1-14).

Regarding claim 3: Takemura discloses carbide and/or nitride and an austenite phase coexist in the carbonitrided surface layer of the steel (see column 5, lines 62 to 67).

As to the method of manufacturing processes, a product by process claim is rejected over a prior art product that appears to be identical, although produced by a different process, the burden is upon the applicants to come forward with evidence establishing an unobvious difference between the two. See *In re Marosi*, 218 USPQ 289 (Fed. Cir. 1983).

Regarding claim 5: Takemura discloses cold working before being carbonitrided (see column 8, lines 29 to 45).

Additionally, as to the method of manufacturing processes, a product by process claim is rejected over a prior art product that appears to be identical, although produced by a different process, the burden is upon the applicants to come forward with evidence establishing an unobvious difference between the two. See *In re Marosi*, 218 USPQ 289 (Fed. Cir. 1983).

Regarding claim 10: Bando discloses said cam follower body is mounted on one end of a rocker arm, said rocker arm is pivotably attached to a rotational shaft located between said one end and the other end, one end of an open/close valve of said engine abuts on said other end (see figure 4), said cam follower body on said one end has a

bifurcated roller supporting portion, and said roller shaft is fixed to said bifurcated roller supporting portion (see figure 6).

Regarding claim 22: Bando discloses said roller shaft has its end with a hardness lower than that of its central portion (see abstract).

Regarding claims 25,28: Bando discloses the claimed invention as recited above except for caulked end and entirely press-formed. As to the method of caulking/press fitting, a product by process claim is rejected over a prior art product that appears to be identical, although produced by a different process, the burden is upon the applicants to come forward with evidence establishing an unobvious difference between the two. See *In re Marosi*, 218 USPQ 289 (Fed. Cir. 1983)

15. Claims 8,11,17,20,26,29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Brothers (6,328,009) in view of Mitamura; and further in view of Hirakawa et al. (6,012,851), and further in view of Kim et al. (Journal of Heat Treat.); and further in view of Takemura (6,342,109).

Regarding claim 8: Brothers discloses a roller cam follower of an engine (see figures 1-9), comprising: an outer ring being in rolling contact with a camshaft of the engine (see numeral 30), a roller shaft located inside said outer ring and fixed to a cam



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follower body (see numeral 36); and bearing elements placed between said outer ring and said roller shaft (see numerals 32,35).

Brothers fails to disclose compositions of JIS-SUJ2 steel, at least one of said outer ring, roller shaft and bearing elements has a carbonitrided layer and has a fracture stress of at least 2650 Mpa; has a hydrogen content of at most 0.5 ppm.

Mitamura teaches using JIS-SUJ2 steel in order to secure a long rolling fatigue life (see column 1, lines 15 to 25).

Hirakawa teaches at least one of said outer ring, roller shaft and bearing elements has a carbonitrided layer (see column 3, lines 52 to 58; Table 1).

In addition, Kim shows the fracture strength (stress) of carbonitrided steels can be 3220 Mpa (see abstract).

Furthermore, Takemura (6,342,109) shows the diffusible hydrogen content in carbonitrided material can be not more than 0.1 ppm in order to enhance the brittleness (see column 10, lines 15 to 25).

Furthermore, Ueda shows the total hydrogen content can be less than 0.5 ppm in order to prevent soot (see abstract; figure 1).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Brothers' device by providing JIS-SUJ2 steel as taught by Mitamura in order to secure a long rolling fatigue life as taught by Mitamura. It also would have been obvious to further modify by providing carbonitrided layer as taught by Hirakawa in order to improve the physical properties of the device and thereby enhance the longevity of the device in engine operation. It would have been obvious to use the

greater fracture stress as taught by Kim in order to increase the longevity of the device. It also would have been obvious to one having ordinary skill in the art at the time the invention was made to further modify Brothers' device by providing hydrogen content as taught by Takemura (6,342,109)/Ueda in order to enhance the brittleness and prevent soot as taught by Takemura (6,342,109)/Ueda.

As to the method of manufacturing processes, a product by process claim is rejected over a prior art product that appears to be identical, although produced by a different process, the burden is upon the applicants to come forward with evidence establishing an unobvious difference between the two. See *In re Marosi*, 218 USPQ 289 (Fed. Cir. 1983).

Additionally, Takemura et al. (6,440,232) shows the inherent manufacturing steps of the manufacturing process for carbonitriding (see figure 3A).

There is no reason to believe the known manufacturing process wouldn't use the claimed numerical characteristic values or modify the quenching temperature for a desired size of the structure.

Exhibit: Maeda et al (6,158,263) shows a quenching temperature reduced to 800-840 degrees to adjust the size of the structure (column 3:1-14).

Regarding claim 11: Brothers discloses said cam follower body is mounted on one end of a rocker arm, said rocker arm is pivotably attached to a rotational shaft located between said one end and the other end, one end of an open/close valve of said engine abuts on said other end (see figures 1,2), said cam follower body on said

one end has a bifurcated roller supporting portion, and said roller shaft is fixed to said bifurcated roller supporting portion (see figure 9).

Regarding claim 17: Brothers discloses a rocker arm is pivotably attached to a rotational shaft located between one end and the other end of said rocker arm (see figures 1-9), an end of an open/close valve of said engine abuts on said one end (see numeral 20), said other end abuts on one end of an interlocking rod transmitting a stress from said cam (see numeral 16), said cam follower body is mounted on the other end of said interlocking rod (see numeral 14), said one end and said other end of said interlocking rod being located respectively on said rocker arm and said cam, and said roller shaft is attached to said cam follower body and abuts on said cam (see figures 1,2,9).

Regarding claim 20: Brothers discloses said bearing elements are full type needle bearings (see figures 1-9; column 2, lines 27 to 45).

Regarding claims 26,29: Brothers discloses the claimed invention as recited above except for caulked end and entirely press-formed. As to the method of caulking/press fitting, a product by process claim is rejected over a prior art product that appears to be identical, although produced by a different process, the burden is upon the applicants to come forward with evidence establishing an unobvious difference between the two. See *In re Marosi*, 218 USPQ 289 (Fed. Cir. 1983)

16. Claims 9,12,18,21,27,30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Brothers (6,328,009) in view of Mitamura; and further in view of Hirakawa et al. (6,012,851), and further in view of Takemura (6,342,109).

Regarding claim 9: Brothers discloses a roller cam follower of an engine (see figures 1-9), comprising: an outer ring being in rolling contact with a camshaft of the engine (see numeral 30), a roller shaft located inside said outer ring and fixed to a cam follower body (see numeral 36); and bearing elements placed between said outer ring and said roller shaft (see numerals 32,35).

Brothers fails to disclose compositions of JIS-SUJ2 steel, at least one of said outer ring, roller shaft and bearing elements has a carbonitrided layer and has a fracture stress/hydrogen content of at least/most 2650/0.5 Mpa/ppm.

Mitamura teaches using JIS-SUJ2 steel in order to secure a long rolling fatigue life (see column 1, lines 15 to 25).

However, Hirakawa teaches at least one of said outer ring, roller shaft and bearing elements has a carbonitrided layer (see column 3, lines 52 to 58; Table 1).

In addition, Takemura (6,342,109) shows the diffusible hydrogen content in carbonitrided material can be not more than 0.1 ppm in order to enhance the brittleness (see column 10, lines 15 to 25).

Furthermore, Ueda shows the total hydrogen content can be less than 0.5 ppm in order to prevent soot (see abstract; figure 1).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Brothers' device by providing JIS-SUJ2 steel as taught by Mitamura in order to secure a long rolling fatigue life as taught by Mitamura. It also would have been obvious to further modify by providing carbonitided layer as taught by Hirakawa in order to improve the physical properties of the device and thereby enhance the longevity of the device in engine operation. It would have been obvious to use the hydrogen content as taught by Takemura/Ueda in order to enhance the brittleness or prevent soot as taught by Takemura/Ueda.

As to the method of manufacturing processes, a product by process claim is rejected over a prior art product that appears to be identical, although produced by a different process, the burden is upon the applicants to come forward with evidence establishing an unobvious difference between the two. See *In re Marosi*, 218 USPQ 289 (Fed. Cir. 1983).

Additionally, Takemura et al. (6,440,232) shows the inherent manufacturing steps of the manufacturing process for carbonitriding (see figure 3A).

There is no reason to believe the known manufacturing process wouldn't use the claimed numerical characteristic values or modify the quenching temperature for a desired size of the structure.

Exhibit: Maeda et al (6,158,263) shows a quenching temperature reduced to 800-840 degrees to adjust the size of the structure (column 3:1-14).

Regarding claim 12: Brothers discloses said cam follower body is mounted on one end of a rocker arm, said rocker arm is pivotably attached to a rotational shaft located between said one end and the other end, one end of an open/close valve of said engine abuts on said other end (see figures 1,2), said cam follower body on said one end has a bifurcated roller supporting portion, and said roller shaft is fixed to said bifurcated roller supporting portion (see figure 9).

Regarding claim 18: Brothers discloses a rocker arm is pivotably attached to a rotational shaft located between one end and the other end of said rocker arm (see figures 1-9), an end of an open/close valve of said engine abuts on said one end (see numeral 20), said other end abuts on one end of an interlocking rod transmitting a stress from said cam (see numeral 16), said cam follower body is mounted on the other end of said interlocking rod (see numeral 14), said one end and said other end of said interlocking rod being located respectively on said rocker arm and said cam, and said roller shaft is attached to said cam follower body and abuts on said cam (see figures 1,2,9).

Regarding claim 21: Brothers discloses said bearing elements are full type needle bearings (see figures 1-9; column 2, lines 27 to 45).

Regarding claims 27,30: Brothers discloses the claimed invention as recited above except for caulked end and entirely press-formed. As to the method of

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caulking/press fitting, a product by process claim is rejected over a prior art product that appears to be identical, although produced by a different process, the burden is upon the applicants to come forward with evidence establishing an unobvious difference between the two. See *In re Marosi*, 218 USPQ 289 (Fed. Cir. 1983)

17. Claims 8,14,26,29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Faville et al. (5,979,383) in view of Mitamura; and further in view of Hirakawa et al. (6,012,851), and further in view of Kim et al. (Journal of Heat Treat.); and further in view of Takemura (6,342,109).

Regarding claim 8: Faville discloses a roller cam follower of an engine (see figures 1-3), comprising: an outer ring being in rolling contact with a camshaft of the engine (see numeral 42), a roller shaft located inside said outer ring and fixed to a cam follower body (see numeral 58); and bearing elements placed between said outer ring and said roller shaft (see numeral 60).

Faville fails to disclose compositions of JIS-SUJ2 steel, at least one of said outer ring, roller shaft and bearing elements has a carbonitrided layer and has a fracture stress of at least 2650 Mpa and nondiffusible hydrogen content of at most 0.5 ppm.

Mitamura teaches using JIS-SUJ2 steel in order to secure a long rolling fatigue life (see column 1, lines 15 to 25).

Hirakawa teaches at least one of said outer ring, roller shaft and bearing elements has a carbonitrided layer (see column 3, lines 52 to 58; Table 1).

In addition, Kim shows the fracture strength (stress) of carbonitrided steels can be 3220 Mpa (see abstract).

Furthermore, Takemura (6,342,109) shows the diffusible hydrogen content in carbonitrided material can be not more than 0.1 ppm in order to enhance the brittleness (see column 10, lines 15 to 25).

Furthermore, Ueda shows the total hydrogen content can be less than 0.5 ppm in order to prevent soot (see abstract; figure 1).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Faville's device by providing JIS-SUJ2 steel as taught by Mitamura in order to secure a long rolling fatigue life as taught by Mitamura. It also would have been obvious to further modify by providing carbonitrided layer as taught by Hirakawa in order to improve the physical properties of the device and thereby enhance the longevity of the device in engine operation. It would have been obvious to use the greater fracture stress as taught by Kim in order to increase the longevity of the device. It also would have been obvious to one having ordinary skill in the art at the time the invention was made to further modify Faville's device by providing hydrogen content as taught by Takemura (6,342,109)/Ueda in order to enhance the brittleness or prevent soot as taught by Takemura (6,342,109)/Ueda.

As to the method of manufacturing processes, a product by process claim is rejected over a prior art product that appears to be identical, although produced by a different process, the burden is upon the applicants to come forward with evidence



establishing an unobvious difference between the two. See *In re Marosi*, 218 USPQ 289 (Fed. Cir. 1983).

Additionally, Takemura et al. (6,440,232) shows the inherent manufacturing steps of the manufacturing process for carontriding (see figure 3A).

There is no reason to believe the known manufacturing process wouldn't use the claimed numerical characteristic values or modify the quenching temperature for a desired size of the structure.

Exhibit: Maeda et al (6,158,263) shows a quenching temperature reduced to 800-840 degrees to adjust the size of the structure (column 3:1-14).

Regarding claim 14: Faville discloses said cam follower body is mounted between one end and the other end of a rocker arm (see figure 1), said roller shaft is fixed in a roller hole extending between two sidewalls of the rocker arm (see figure 3), an end of an open/close valve of said engine abuts on said one end of said rocker arm, and a pivot abuts on said other end (see figure 1).

Regarding claim 26,29: Faville discloses the claimed invention as recited above except for caulked end and entirely press-formed. As to the method of caulking/press fitting, a product by process claim is rejected over a prior art product that appears to be identical, although produced by a different process, the burden is upon the applicants to come forward with evidence establishing an unobvious difference between the two. See *In re Marosi*, 218 USPQ 289 (Fed. Cir. 1983)

18. Claims 9,15,27,30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Faville et al. (5,979,383) in view of Mitamura; and further in view of Hirakawa et al. (6,012,851), and further in view of Takemura (6,342,109).

Regarding claim 9: Faville discloses a roller cam follower of an engine (see figures 1-3), comprising: an outer ring being in rolling contact with a camshaft of the engine (see numeral 42), a roller shaft located inside said outer ring and fixed to a cam follower body (see numeral 58); and bearing elements placed between said outer ring and said roller shaft (see numeral 60).

Faville fails to disclose compositions of JIS-SUJ2 steel, at least one of said outer ring, roller shaft and bearing elements has a carbonitrided layer and has a non diffusible hydrogen content of at most 0.5 ppm.

Mitamura teaches using JIS-SUJ2 steel in order to secure a long rolling fatigue life (see column 1, lines 15 to 25).

Hirakawa teaches at least one of said outer ring, roller shaft and bearing elements has a carbonitrided layer (see column 3, lines 52 to 58; Table 1).

In addition, Takemura (6,342,109) shows the diffusible hydrogen content in carbonitrided material can be not more than 0.1 ppm in order to enhance the brittleness (see column 10, lines 15 to 25).

Furthermore, Ueda shows the total hydrogen content can be less than 0.5 ppm in order to prevent soot (see abstract; figure 1).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Faville's device by providing JIS-SUJ2 steel as taught by Mitamura in order to secure a long rolling fatigue life as taught by Mitamura. It also would have been obvious to further modify by providing carbonitided layer as taught by Hirakawa in order to improve the physical properties of the device and thereby enhance the longevity of the device in engine operation. It would have been obvious to use the hydrogen content as taught by Takemura/Ueda in order to enhance the brittleness as taught by Takemura/Ueda.

As to the method of manufacturing processes, a product by process claim is rejected over a prior art product that appears to be identical, although produced by a different process, the burden is upon the applicants to come forward with evidence establishing an unobvious difference between the two. See *In re Marosi*, 218 USPQ 289 (Fed. Cir. 1983).

Additionally, Takemura et al. (6,440,232) shows the inherent manufacturing steps of the manufacturing process for carbonitriding (see figure 3A).

There is no reason to believe the known manufacturing process wouldn't use the claimed numerical characteristic values or modify the quenching temperature for a desired size of the structure.

Exhibit: Maeda et al (6,158,263) shows a quenching temperature reduced to 800-840 degrees to adjust the size of the structure (column 3:1-14).

Regarding claim 15: Faville discloses said cam follower body is mounted between one end and the other end of a rocker arm (see figure 1), said roller shaft is fixed in a roller hole extending between two sidewalls of the rocker arm (see figure 3), an end of an open/close valve of said engine abuts on said one end of said rocker arm, and a pivot abuts on said other end (see figure 1).

Regarding claim 27,30: Faville discloses the claimed invention as recited above except for caulked end and entirely press-formed. As to the method of caulking/press fitting, a product by process claim is rejected over a prior art product that appears to be identical, although produced by a different process, the burden is upon the applicants to come forward with evidence establishing an unobvious difference between the two. See *In re Marosi*, 218 USPQ 289 (Fed. Cir. 1983)

19. Claims 8,11,23,26,29, are rejected under 35 U.S.C. 103(a) as being unpatentable over Bando (JP63-185917) in view of Mitamura; and further in view of Hirakawa et al. (6,012,851), and further in view of Kim et al. (Journal of Heat Treat.), further in view of Takemura (6,342,109).

Regarding claim 8: Bando discloses a roller cam follower of an engine (see figure 4), comprising: an outer ring being in rolling contact with a camshaft of the engine, a

roller shaft located inside said outer ring and fixed to a cam follower body; and bearing elements placed between said outer ring and said roller shaft (see figure 6).

Bando fails to disclose compositions of JIS-SUJ2 steel, at least one of said outer ring, roller shaft and bearing elements has a carbonitrided layer and has a fracture stress/non-diffusible hydrogen content of at least/most 2650/0.5 Mpa/ppm.

Mitamura teaches using JIS-SUJ2 steel in order to secure a long rolling fatigue life (see column 1, lines 15 to 25).

Hirakawa teaches at least one of said outer ring, roller shaft and bearing elements has a carbonitrided layer (see column 3, lines 52 to 58; Table 1).

In addition, Kim shows the fracture strength (stress) of carbonitrided steels can be 3220 Mpa (see abstract).

Moreover, Takemura (6,342,109) shows the non-diffusible hydrogen content in carbonitrided material can be not more than 0.1 ppm in order to enhance the brittleness (see column 10, lines 15 to 25).

Furthermore, Ueda shows the total hydrogen content can be less than 0.5 ppm in order to prevent soot (see abstract; figure 1).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Bando's device by providing JIS-SUJ2 steel as taught by Mitamura in order to secure a long rolling fatigue life as taught by Mitamura. It also would have been obvious to further modify by providing carbonitrided layer as taught by Hirakawa in order to improve the physical properties of the device and thereby enhance the longevity of the device in engine operation. It would have been obvious to use the

greater fracture stress as taught by Kim in order to increase the longevity of the device. It also would have been obvious to one having ordinary skill in the art at the time the invention was made to further modify Bando's device by providing hydrogen content as taught by Takemura (6,342,109)/Ueda in order to enhance the brittleness or prevent soot as taught by Takemura (6,342,109)/Ueda.

As to the method of manufacturing processes, a product by process claim is rejected over a prior art product that appears to be identical, although produced by a different process, the burden is upon the applicants to come forward with evidence establishing an unobvious difference between the two. See *In re Marosi*, 218 USPQ 289 (Fed. Cir. 1983).

Additionally, Takemura et al. (6,440,232) shows the inherent manufacturing steps of the manufacturing process for carbonitriding (see figure 3A).

There is no reason to believe the known manufacturing process wouldn't use the claimed numerical characteristic values or modify the quenching temperature for a desired size of the structure.

Exhibit: Maeda et al (6,158,263) shows a quenching temperature reduced to 800-840 degrees to adjust the size of the structure (column 3:1-14).

Regarding claim 11: Bando discloses said cam follower body is mounted on one end of a rocker arm, said rocker arm is pivotably attached to a rotational shaft located between said one end and the other end, one end of an open/close valve of said engine abuts on said other end (see figure 4), said cam follower body on said one end has a

bifurcated roller supporting portion, and said roller shaft is fixed to said bifurcated roller supporting portion (see figure 6).

Regarding claim 23: Bando discloses said roller shaft has its end with a hardness lower than that of its central portion (see abstract).

Regarding claims 26,29: Bando discloses the claimed invention as recited above except for caulked end and entirely press-formed. As to the method of caulking/press fitting, a product by process claim is rejected over a prior art product that appears to be identical, although produced by a different process, the burden is upon the applicants to come forward with evidence establishing an unobvious difference between the two. See *In re Marosi*, 218 USPQ 289 (Fed. Cir. 1983)

20. Claims 9,12,24,27,30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bando (JP63-185917) in view of Mitamura; and further in view of Hirakawa et al. (6,012,851), and further in view of Takemura (6,342,109), and further in view of Ueda.

Regarding claim 9: Bando discloses a roller cam follower of an engine (see figure 4), comprising: an outer ring being in rolling contact with a camshaft of the engine, a roller shaft located inside said outer ring and fixed to a cam follower body; and bearing elements placed between said outer ring and said roller shaft (see figure 6).

Bando fails to disclose compositions of JIS-SUJ2 steel, at least one of said outer ring, roller shaft and bearing elements has a carbonitrided layer and has a fracture stress/hydrogen content of at least/most 2650/0.5 Mpa/ppm.

Mitamura teaches using JIS-SUJ2 steel in order to secure a long rolling fatigue life (see column 1, lines 15 to 25).

Hirakawa teaches at least one of said outer ring, roller shaft and bearing elements has a carbonitrided layer (see column 3, lines 52 to 58; Table 1).

In addition, Takemura (6,342,109) shows the hydrogen content in carbonitrided material can be not more than 0.1 ppm in order to enhance the brittleness (see column 10, lines 15 to 25).

Furthermore, Ueda shows the total hydrogen content can be less than 0.5 ppm in order to prevent soot (see abstract; figure 1).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Bando's device by providing JIS-SUJ2 steel as taught by Mitamura in order to secure a long rolling fatigue life as taught by Mitamura. It also would have been obvious to further modify by providing carbonitrided layer as taught by Hirakawa in order to improve the physical properties of the device and thereby enhance the longevity of the device in engine operation. It would have been obvious to use the hydrogen content as taught by Takemura/Ueda in order to enhance the brittleness or prevent soot as taught by Takemura/Ueda.

As to the method of manufacturing processes, a product by process claim is rejected over a prior art product that appears to be identical, although produced by a



different process, the burden is upon the applicants to come forward with evidence establishing an unobvious difference between the two. See *In re Marosi*, 218 USPQ 289 (Fed. Cir. 1983).

Additionally, Takemura et al. (6,440,232) shows the inherent manufacturing steps of the manufacturing process for carontriding (see figure 3A).

There is no reason to believe the known manufacturing process wouldn't use the claimed numerical characteristic values or modify the quenching temperature for a desired size of the structure.

Exhibit: Maeda et al (6,158,263) shows a quenching temperature reduced to 800-840 degrees to adjust the size of the structure (column 3:1-14).

Regarding claim 12: Bando discloses said cam follower body is mounted on one end of a rocker arm, said rocker arm is pivotably attached to a rotational shaft located between said one end and the other end, one end of an open/close valve of said engine abuts on said other end (see figure 4), said cam follower body on said one end has a bifurcated roller supporting portion, and said roller shaft is fixed to said bifurcated roller supporting portion (see figure 6).

Regarding claim 24: Bando discloses said roller shaft has its end with a hardness lower than that of its central portion (see abstract).

Regarding claims 27,30: Bando discloses the claimed invention as recited above except for caulked end and entirely press-formed. As to the method of caulking/press fitting, a product by process claim is rejected over a prior art product that appears to be identical, although produced by a different process, the burden is upon the applicants to come forward with evidence establishing an unobvious difference between the two. See *In re Marosi*, 218 USPQ 289 (Fed. Cir. 1983)

### ***Response to Arguments***

21. In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

22. Applicant's argument in attacking the Mitamura reference and basing the unexpected result by comparing with Mitamura alone is not persuasive. First, the Mitamura reference is used in its prior art teaching (column 1, lines 15 to 25). Second, it is used in combination with other references that teach for example, carbonitiding as recited above. Therefore, the evidence for the unexpected result is not persuasive for it is based on a single reference alone and doesn't reflect the totalality of the rejection.

23. With respect to the argument about the manufacturing steps: As to the method of manufacturing processes, a product by process claim is rejected over a prior art product that appears to be identical, although produced by a different process, the burden is

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upon the applicants to come forward with evidence establishing an unobvious difference between the two. See *In re Marosi*, 218 USPQ 289 (Fed. Cir. 1983).

Additionally, Takemura et al. (6,440,232) shows the inherent manufacturing steps of the manufacturing process for carontriding (see figure 3A). As to the specifics of the manufacturing steps (emphasis added); there is no reason to believe the known manufacturing process wouldn't use the claimed numerical characteristic values or modify the quenching temperature for a desired size of the structure.

Exhibit: Maeda et al (6,158,263) shows a quenching temperature reduced to 800-840 degrees to adjust the size of the structure (column 3:1-14).

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Zelalem Eshete whose telephone number is (571) 272-4860. The examiner can normally be reached on Monday to Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Thomas Denion can be reached on (571) 272-4859. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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/Zelalem Eshete/  
Primary Examiner, Art Unit 3748